

PR 9.3 Non-FCM Weld Repairs

1. PURPOSE

This procedure provides instruction for repair welding defined as any welding, including removal of weld metal or base metal in preparation for welding, necessary to correct defects in materials or workmanship.

2. SCOPE

This procedure has been prepared for the repair of welds in accordance with AASHTO/AWS D1.5 Section 3, Workmanship.

3. PROCEDURE

- 3.1. Potential discontinuities shall be reported by either the welder or fitter if discovered during normal fabrication activities or they may be discovered by Structal's inspector during routine inspections.
- 3.2. Once a potential discontinuity has been discovered immediately notify Structal's Inspector of the suspected welding deficiency.
- 3.3. The DOT representative shall be notified before work begins.
- 3.4. The Inspector will determine if a pre-approved procedure may be followed to perform the repair. The repairs included in this procedure are as follows:
 - 3.4.1. Excavation of Groove/Fillet Welds
 - 3.4.2. Repair of Laminar Discontinuities
 - 3.4.3. Repair of Gouges in Cut Edges Less Than 3/8 Inch Deep
 - 3.4.4. Repair of Base Metal Surface Imperfections
- 3.5. If a preapproved repair is unsuccessful three times the Inspector will obtain written approval from the Engineer prior to making any additional repair attempts.

4. INSPECTION

- 4.1. All repairs shall be visually inspected. Repairs to the surfaces and edges of tension and reversal-of-stress members shall be examined by UT and MT. Repairs in tension full penetration butt welds shall be examined by UT and RT. Repairs of full penetration groove welds in compression shall be examined by UT. Fillet weld repairs shall be examined by MT. NDT inspections shall be in accordance with all applicable code requirements.

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5. PREHEAT AND INTERPASS TEMPERATURES

A709-36, 50, 50W		
Thickness	Preheat/Min Interpass	Max. Interpass
To 3/4" Incl.	50°F	450°F
Over 3/4" to 1 1/2" Incl.	70°F	450°F
Over 1 1/2" to 2 1/2" Incl.	150°F	450°F
Over 2 1/2"	225°F	450°F

A709-70W		
Thickness	Preheat/Min Interpass	Max. Interpass
To 3/4" Incl.	50°F	400°F
Over 3/4" to 1 1/2" Incl.	125°F	400°F
Over 1 1/2" to 2 1/2" Incl.	175°F	450°F
Over 2 1/2"	225°F	450°F

6. First Time Excavation of Groove/Fillet Weld

- 6.1. Notify Structural QC of the suspected deficiency. The Inspector shall identify the extent of repair if required.
- 6.2. If arc gouging is used, preheat the area thoroughly to the appropriate temperature from Section 5 before gouging.
- 6.3. Grind the area to be repaired to bright metal and a smooth weldable contour completely removing the discontinuity.
- 6.4. Perform VT and MT inspection to ensure the removal of the discontinuity.
- 6.5. Repair welding shall be made following a WPS approved for the project suitable to the material grade being repaired.
- 6.6. After the material has cooled, grind the repaired area to blend with the contour and finish making sure that grind marks are in the direction of stress.

7. Repair of Laminar Discontinuities less than 1" in length

- 7.1. Notify Structural QC of the suspected deficiency. The Inspector shall identify the extent of repair if required.
- 7.2. If a discontinuity, as defined by AWS D1.5, paragraph 3.2.3.6, can be removed by grinding without reducing the net cross sectional area to less than 98% of the original thickness then grind the area to a smooth and shiny contour in the direction of stress. The surface area shall not be faired to less than a 1 in 10 slope. Machining or grinding marks perpendicular to the applied stress shall not exceed a surface roughness of 125 µin.

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- 7.3. If the discontinuity exceeds the limits above it will require a welded repair.
Grind the area to bright metal and a smooth weldable contour.
- 7.4. Inspect by MT to ensure the removal of the defect.
- 7.5. Repair welding shall be made following a WPS approved for the project suitable to the material grade being repaired.

8. Repair of Laminar Discontinuities greater than 1" in length less than 1" in depth

- 8.1. Notify Structal QC of the suspected deficiency. The Inspector shall identify the extent of repair if required.
- 8.2. For a discontinuity greater than 1" in length with a depth over 1/4" but not greater than 1" the discontinuity shall be removed and repaired by welding. The aggregate length of welding shall not exceed 20% of the length of the material edge being repaired.
- 8.3. The discontinuity shall be removed by grinding or arc gouging. The area shall be ground to a smooth and weldable contour.
- 8.4. Repair welding shall be made following a WPS approved for the project suitable to the material grade being repaired.
- 8.5. After the material has cooled to ambient temperature, grind the repaired area to blend with the contour and finish. Note: Final grinding to be in the direction of stress.

9. Repair of Laminar Discontinuities greater than 1" in length and depth

- 9.1. Notify Structal QC of the suspected deficiency. The Inspector shall identify the extent of repair if required.
- 9.2. For discontinuities greater than 1 inch in length and depth, the area of the discontinuity (or the aggregate area of multiple discontinuities) shall not exceed 4 percent of the plate area. Should the length of the discontinuity on any transverse section, as measured perpendicular to the base metal length, exceed 20 percent of the base metal width, the 4 percent base-metal area shall be reduced by the percentage amount of the width exceeding 20 percent. (For example, if a discontinuity is 30% of the base-metal width, the area of the discontinuity cannot exceed 3.6% of the base-metal area.)
- 9.3. The discontinuity shall then be ground or arc gouged to a depth of 1 inch beyond its intersection with the surface. The area shall be ground to a smooth and weldable contour.
- 9.4. The discontinuity shall be repair welded in accordance with an approved SMAW Repair WPS in layers not exceeding 1/8 inch in thickness for at least four layers. Subsequent layers may be completed following an approved WPS for SAW or FCAW.

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- 9.5. After the material has cooled to ambient temperature, grind the repaired area to blend with the contour and finish. Note: Final grinding to be in the direction of stress.

10. Repair of Gouges in Cut Edges Less Than 3/8" Inch Deep

- 10.1. Notify Structal QC of the suspected deficiency. The Inspector shall identify the extent of repair if required.
- 10.2. Structal QC will contact QA (Owner's or DOT's inspector) for approval to perform the repair.
- 10.3. Gouges 1/4 inch or less in depth shall be removed by grinding. Grinding shall be faired to the oxygen cut surface with a slope not exceeding 1 in 10 and a roughness value that does not exceed 1000 microinches for material up to 4" in thickness or 2000 microinches for material between 4" and 8" in thickness.
- 10.4. Gouges greater than 1/4 inch but less than 3/8 inch in depth shall be repaired by welding.
- 10.5. Grind the deficiency to a smooth weldable contour. Inspect by MT.
- 10.6. Perform repair welding in accordance with an approved WPS.
- 10.7. After the material has cooled to ambient temperature, grind the repaired area to blend with the contour and finish. Final grinding shall be in the direction of stress.

11. Repair of Base Metal Surface Imperfections

- 11.1. Notify Structal QC of the suspected deficiency. The Inspector shall identify the extent of repair if required.
- 11.2. Structal QC will contact QA (Owner's or DOT's inspector) for approval to perform the repair.
- 11.3. Surface blemishes 1/16" or less in depth shall be removed by grinding the area to a smooth and shiny contour in the direction of stress ensuring that the surface area is faired to not less than a 1 in 10 slope.
- 11.4. Inspect by MT to ensure the removal of the defect.
- 11.5. For blemishes greater 1/16" in depth the defect should be repaired by welding.
- 11.6. If welding is required, grind the area to a smooth and weldable contour.
- 11.7. Inspect by MT to ensure the removal of the defect. The depth of grinding shall not exceed 30% of the material thickness without prior approval from the EOR or DOT.
- 11.8. Repair welding shall be made following a WPS approved for the project suitable to the material grade being repaired.
- 11.9. After the material has cooled, grind in the direction of stress the repaired area to blend with the contour and finish.